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(54) Antiseptic purifier for water

(57) A water purifier, suitable for suppressing the growth of bacteria in stored water, comprises one or more filtering means 19 and one or more antiseptic means 20. Preferably the antiseptic device comprises a mesh-like cartridge 22 filled with iodine resin granules 21, the device being located upstream of the filter with the filter be formed of an annular fibriform activated carbon structure 23. Preferably water enters via inlet 19a and exits via outlet 19b. In alternative embodiments the water purifier may either be inserted in a hose member (Fig 4) or the antiseptic means may have a cup-shaped cartridge body with a removable cartridge closure (Fig's 5 and 6). The filtering means may be a post-process filter, ie for purifying water having already passed through a membrane filter. Preferably the iodine resin is formed by reaction between iodine and a negative ion exchange resin.

FIG.3

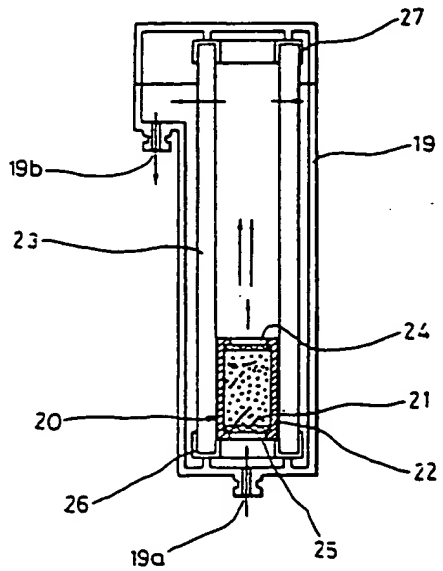

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FIG. 1
(PRIOR ART)

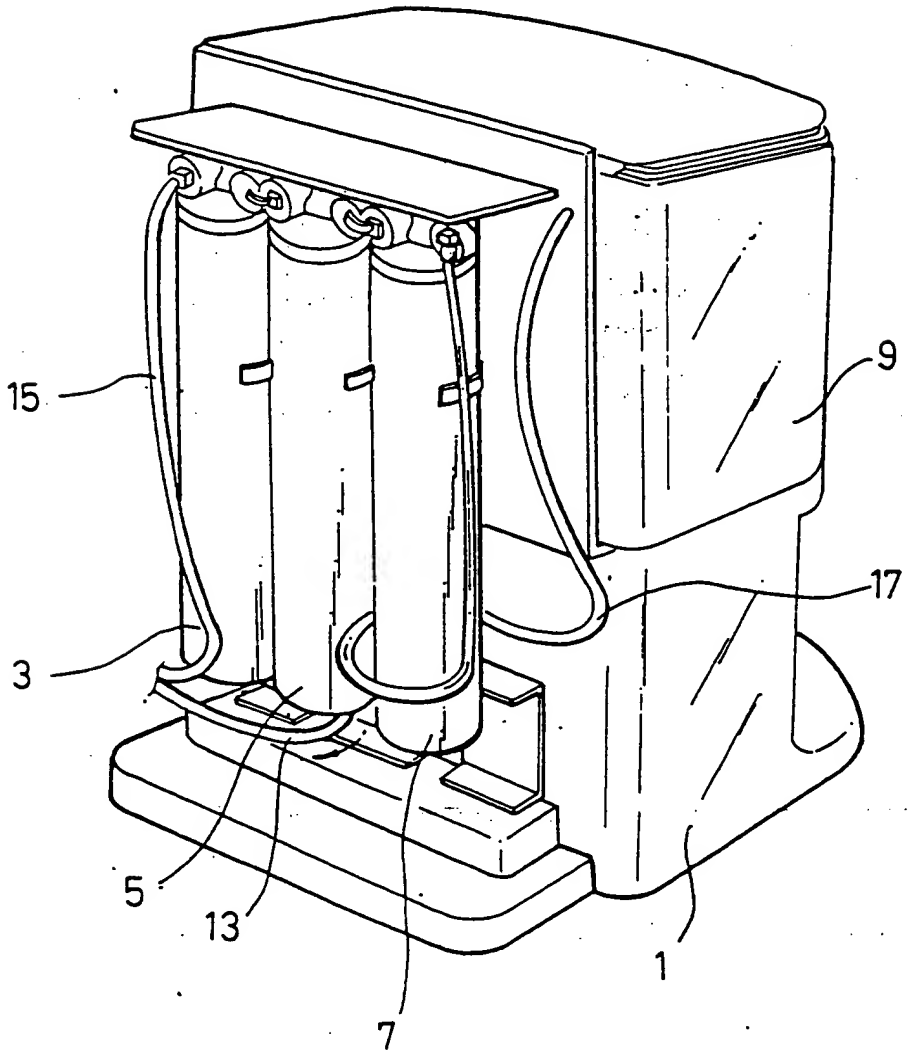


FIG. 2
(PRIOR ART)

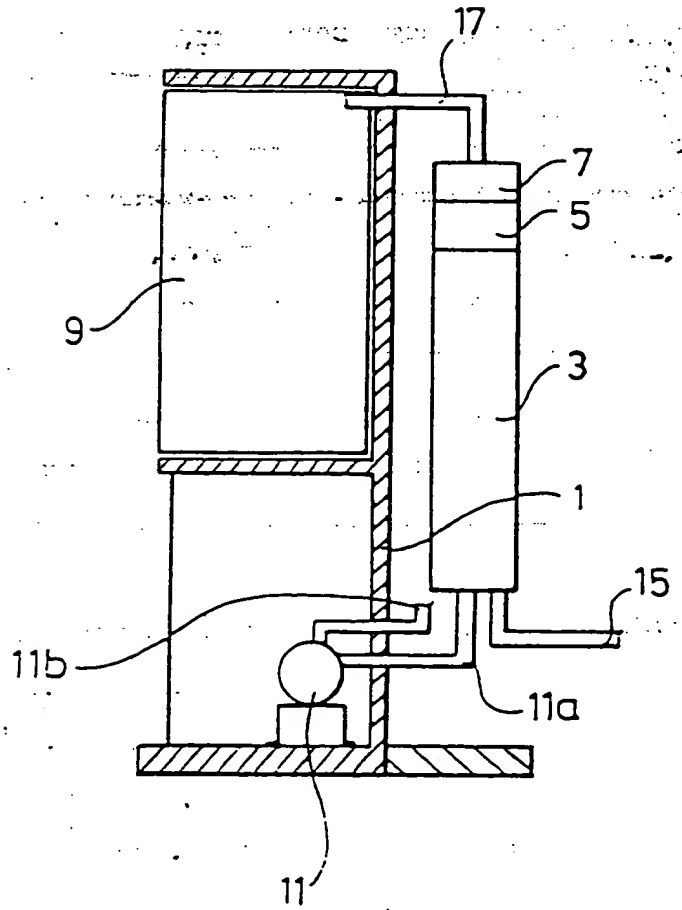


FIG.3

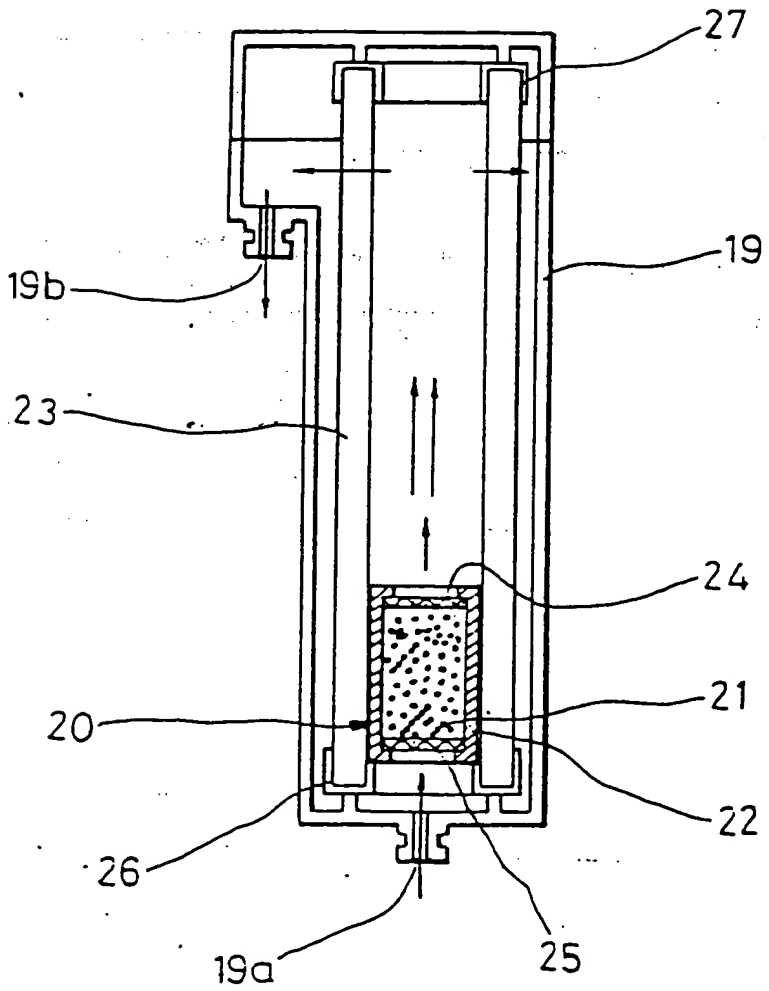


FIG. 4

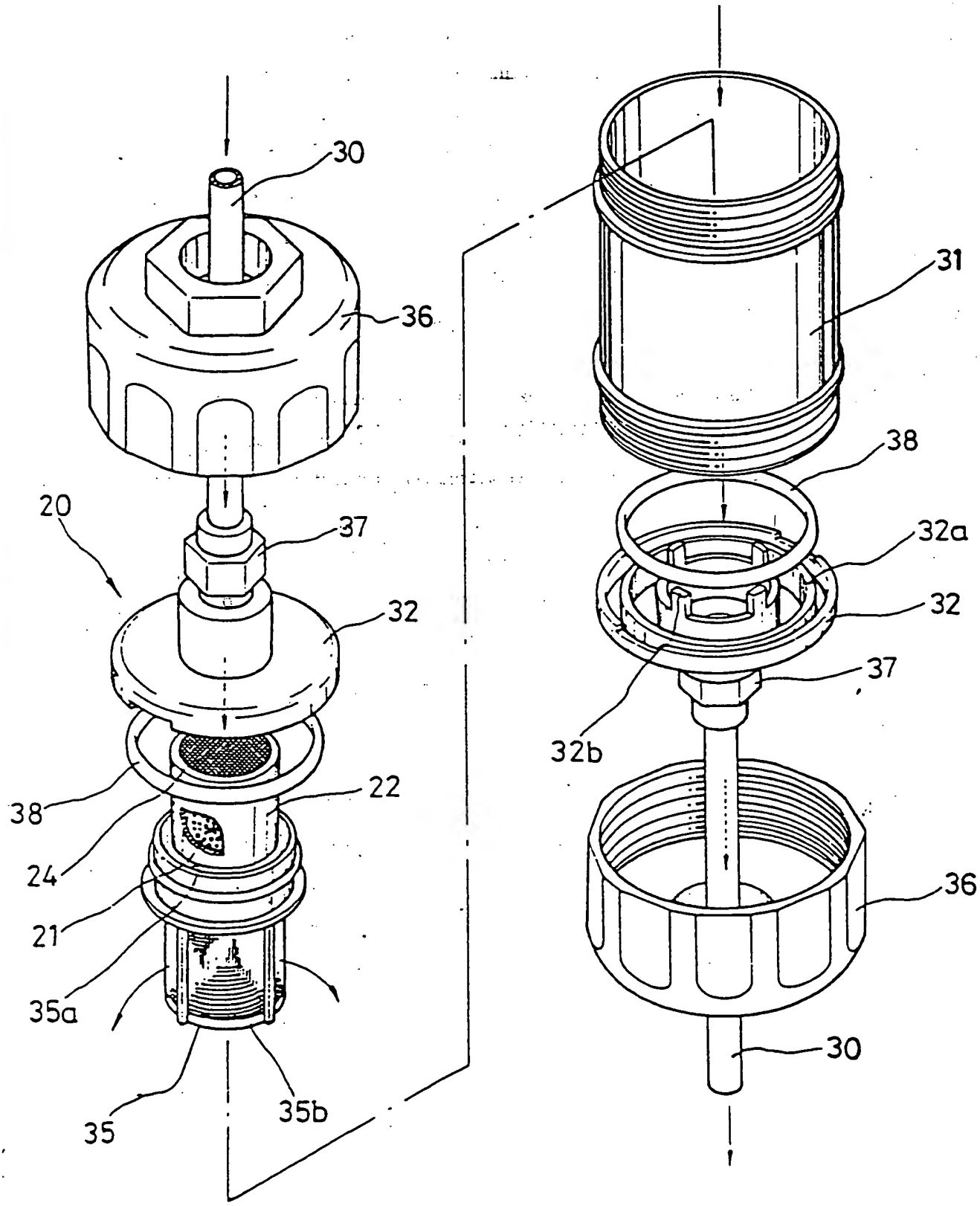


FIG. 5

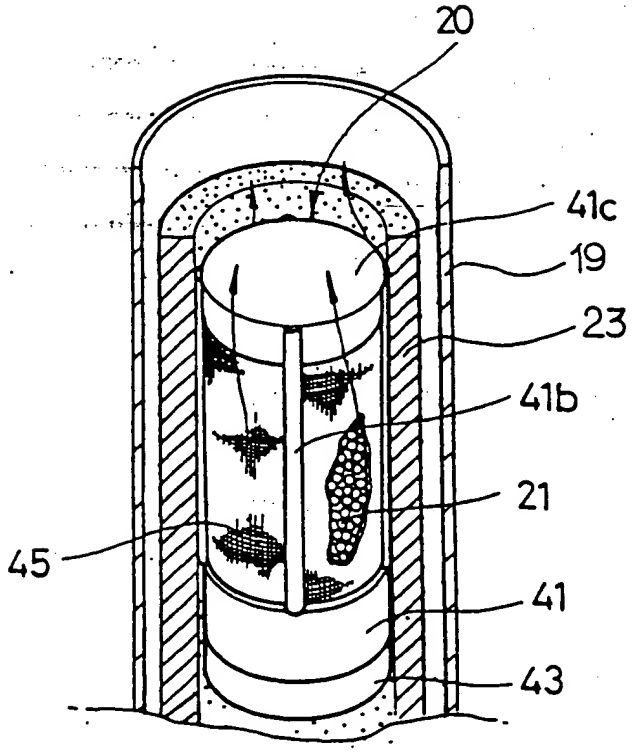


FIG. 6

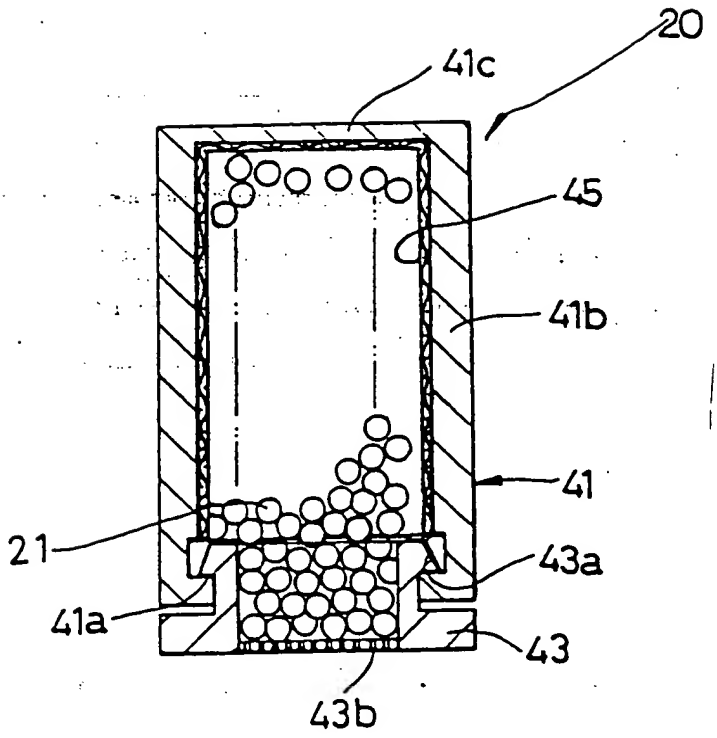
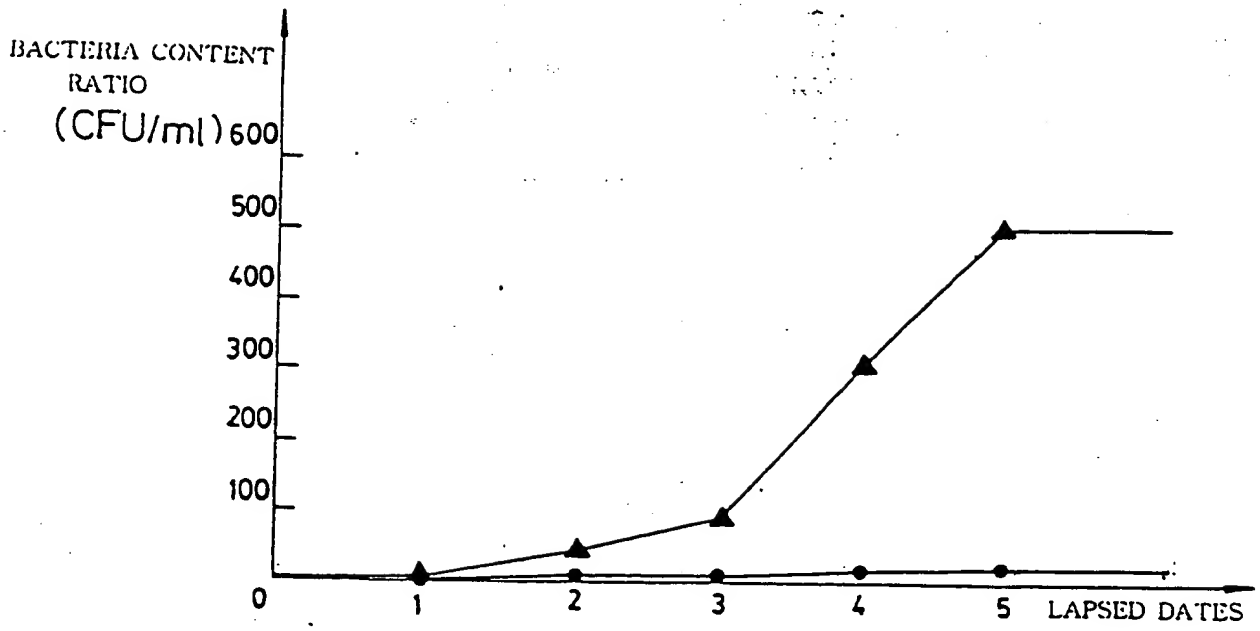


FIG. 7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(CFU/ml)
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500
400
300
200
100
0
1
2
3
4
5
LAPSED DATES

2311775

Water Purifier

Description

The present invention relates to a water purifier employing antiseptic means for suppressing the growth of bacteria in water when the water is stored in a storage tank for a long time.

Referring to Figures 1 and 2, a water purifier, located at the rear of a body 1, includes a pre-process filtering means 3 for protecting membrane 5 from chlorine and foreign bodies contained in tap water supplied from a tap (not shown) and removing therefrom harmful organic compounds. The membrane filtering means 5 is disposed on one side of the pre-process filtering means 3 and serves to remove various heavy metals and cancer-causing materials from water from the pre-process filtering means 3. A post-process filtering means 7 is disposed at the other side of the membrane filtering means 5 and removes odours and gaseous substances from the water flowing from the membrane filtering means 5. A storage tank 9 is disposed at the front of the body 1 for storing water purified by the water purifier. A pump 11 is disposed within the body 1 and is connected to the output of the pre-process filtering means 3 by a tube 11a. The pump 11 pressurises the water filtered by the pre-process filtering means 3 and sends it via tube 11b to the membrane filtering means 5 so that it can penetrate a membrane formed with fine, 0.001μm diameter holes.

The membrane filtering means 5 is provided with a drainage tube 13 for draining the water which has not passed the membrane and which therefore has a high concentration of contaminants.

The pre-process filtering means 3 is connected to the tap (not shown) by a supply tube 15 and the post-process filtering means 7 is connected to the storage tank 9 by a purified water supply tube 17.

When a switch (not shown) is operated, the pressure pump 11 is activated and the ta water, passing through the primary water supply tube 15 and through the pre-process filtering means 3, is pressurised by the pressure pump 11.

Water from the tap (not shown) travels along the tube 15 and through the pre-process filtering means 3. The pre-processed water then flows along tube 11a to the pump 11 where it is pressurised and sent to the membrane filtering means 5 along tube 11b. A substantial part of the pressurised water passes through the membrane filtering means 5 and the post-process filtering means 7. The then purified water is discharged into the storage tank 9 via the tube 17. The water can then be withdrawn from the storage tank 9 as necessary through a valve (not shown).

Not all of the water passes through the membrane filtering means 5 and is instead discharged through a drainage tube 13. This water contains a high concentration of contaminants.

A problem arising with known water purifiers is that micro-organisms can successfully pass through and then multiply in the storage tank. This can be particularly harmful if water remains in the storage tank for extended periods or the storage tank is not cleaned regularly.

According to the present invention, there is provided a water purifier comprising filtering means and an antiseptic device. The water purifier may comprise a plurality of filtering means and a plurality of antiseptic devices.

Preferably, the or each filtering means comprises a post-process filter and an antiseptic device is located immediately upstream of the or each post-process filter.

Preferably, the or each antiseptic means comprises a cartridge filled with iodine resin granules, the cartridge having meshes to allow the inflow and outflow of water to be treated but retain the granules in the cartridge. More preferably, the iodine resin

granules are formed by reacting iodine with a negative ion exchange resin. Advantageously, the granules are from 0.4mm to 1.2mm in diameter and the or each antiseptic means contains from 10g to 20g of iodine resin granules. Preferably, the or each post-process filter comprises an annular structure of fibriform activated carbon and the cartridge is located within the annular structure.

In an embodiment, the or each antiseptic means comprises an assembly upstream of a respective filtering means and connected thereto by a hose. In this case, the or each antiseptic means preferably comprises a cartridge filled with iodine resin granules, the cartridge having meshes to allow the inflow and outflow of water to be treated but retain the granules in the cartridge.

Preferably, the or each assembly comprises: a case; fastening means for fastening inflow and outflow hoses to the case; a cylindrical mesh disposed within the case; and a cartridge filled with iodine resin granules within the cylindrical mesh.

A form of cartridge comprises a cup-shaped body having a removable closure at one end, the side wall of the cartridge comprising an annular mesh. Preferably, axially extending reinforcing members are provided to reinforce the annular mesh. More preferably, the closure is formed with a plurality of fine apertures to allow the inflow of water but prevent the escape of resin granules.

Embodiments of the present invention will now be described, by way of example, with reference to Figures 3 to 7 of the accompanying drawings, in which:

Figure 1 is a perspective view of a prior art water purifier;

Figure 2 is a longitudinal sectional view of the prior art water purifier;

Figure 3 is a longitudinal sectional view of a first embodiment of the present invention;

Figure 4 is a exploded view of a second embodiment of the present invention;

Figure 5 is a cut-away view of a third embodiment of the present invention;

Figure 6 is a sectional view of the antiseptic means in Figure 5; and

Figure 7 is a graph for illustrating change of bacteria content ratio against time for prior art water purifier and a water purifier according to the present invention.

Referring to Figure 3, a water purifier according to the present invention is located within a post-process filtering means 19 for purifying water having passed a membrane filtering means (see reference numeral 5 in Figure 1), as illustrated in Figure 3. The water purifier includes antiseptic means 20 for killing bacteria. The antiseptic means 20 comprises a cartridge 22 filled with granules of iodine resin 21. The cartridge 22 is located within a fibriform activated carbon filter 23 for removing odorous and gaseous components in the water. The upper and lower end faces of the cartridge 22 are formed from a mesh through which water can pass. Sealing members 26, 27 are provided for preventing leakage. An inlet 19a is provided for the passage of water from the membrane filtering means (not shown). An outlet 19b is provided for the outflow of water which has passed through the iodine resin 21 and the fibriform activated carbon filter 23.

Although in the foregoing description the antiseptic means 20 is disposed at a lower end of the post-process means 19, the present invention is not limited thereto. It is possible to have the antiseptic means 20 disposed at an upper end of the post-process filtering means 19. Furthermore, a plurality of antiseptic means may be provided.

The operation of the above-described embodiment will now be described.

The water, having passed the membrane filtering means, flows through the inlet 19a and enters the cartridge 22 through the mesh member 25. The inflowing water is sterilised as it contacts the iodine resin 21. The water flows then in the direction shown by the arrows in Figure 3, passes through the fibriform activated carbon filter 23 and is discharged through the outlet 19b.

The iodine resin 21 can deactivate bacteria and viruses even in a short period so that almost perfect sterilisation can be possible. Moreover, the iodine resin 21 is

economical in that it avoids the need for electrical appliances for sterilisation, and has an average useful life of about 2 years so that it can be replaced when the post-process filtering means 19 itself is normally replaced.

A second embodiment of the present invention will now be described.

In Figure 4, like reference numerals as used in Figure 3 are used for designation of like or equivalent parts or portions for simplicity of illustration and explanation.

Referring to Figure 4, a water purifier is inserted in a hose member 30 leading from the membrane filter (reference numeral 5 in Figure 1). The water purifier comprises a case member 31 having connecting members 32 at either end for connecting it into the hose member 30. The connecting members 32 are threaded and are engaged by clamping nuts 37 for fixing the hose member 30 to the water purifier. A cartridge 22, filled with granular iodine resin 21, is located within the case member 31 such that water flowing through the case member 31 must pass therethrough. A cylindrical mesh 35 is disposed coaxially about the cartridge 22 to secure the cartridge 22 in the case member 31.

The connecting members 32 are provided with respective circumferential and inboard annular walls 32a to form channels to receive the ends of the case member 31. An annular press unit 32b projects coaxially from the central region of each connecting member 32 at a predetermined spacing in order to pass the cylindrical mesh 35.

Mesh members 24 are provided at respective ends of the cartridge 22 so that water can pass through the cartridge 22 without washing away the iodine resin 21.

The cylindrical mesh 35 is open at one end 35a to allow water to pass and to allow the cartridge 22 to be inserted therein. The other end of the mesh 35 is provided with a flat unit 35b for being fixedly engaged by the press unit 32b of one of the connecting member 32.

A sealing member 38 is provided for preventing leakage of the water.

The operation of the embodiment of Figure 4 will now be described.

Water enters the water purifier along the hose member 30 in the direction of the arrow in Figure 4. The water flows through the mesh member 30 at the upper end of the cartridge 22 and is sterilised by contact with the iodine resin 21 in the cartridge 22. The sterilised water exits the cartridge 22 via the mesh member at the other end of the cartridge 22 and then through the cylindrical mesh 35. The water having passed through the cylindrical mesh 35 is discharged through the hose member 30.

When the iodine resin 21 has reached the end of its useful life, the nut member 36 is unlocked and the connecting member 32 is separated from the case member 31. The cylindrical mesh 35 is then extracted and the cartridge 22 exchanged for a new one. The unit is then reassembled by the reverse procedure.

Accordingly, it is a simple job for a user to replace the iodine resin 21.

A third embodiment of the present invention will now be described.

Referring to Figures 5 and 6, a water purifier comprises an antiseptic means 20 within the cylindrical fibriform activated carbon filter 23 of a post-process filtering means 19, as illustrated in Figures 5 and 6. The antiseptic means 20 comprises a cup-shaped cartridge body 41, granular iodine resin 21 held within the cartridge 41, a cartridge closure 43 closing the lower end of the cartridge 41 to prevent the escape of iodine resin granules 21, and a mesh member 45 for filtering easily the sterilised, purified water as it passes through the cartridge 41. The mesh member 45 is fixed to the inside of the cartridge 41 by a high frequency fusion method. The cartridge closure 43 is formed with a latch 43a at one side to hold it in place. The cartridge closure 43 is provided with fine holes 43b for allowing water to pass into the cartridge 41. The

holes 43b are small enough to prevent the iodine resin granules 21 escaping. The cartridge 41 has axial reinforcing frames 41b for reinforcing the mesh member 45, and is closed at the upper end by a round plate 41C.

The operation of the embodiment of Figures 5 and 6 will now be described.

Water enters the post-process filtering means 19 and then enters the cartridge 41 through the holes 43b. The water entering the cartridge 41 is sterilised by contact with the iodine resin granules 21, and then flows out through the mesh member 45 and the fibriform activated carbon filter 23.

The antiseptic means 20 can be easily filled with the iodine resin 21 because the cartridge cover 43 may be removed.

Holes may also be provided in the round plate 41c. These holes need to be small enough to retain the iodine resin granules 21 in the cartridge 41.

A detailed description of the iodine resin will now be given.

The halogens occupy Group 7B of the Periodic Table and exist as elementary molecules, Cl_2, Br_2, I_2 etc. at room temperature. At room temperature, chlorine is gaseous, bromine is liquid and iodine is solid. Halogens have excellent antiseptic properties and are widely used in disinfectants.

The chlorine has been widely used in filtration plants, swimming pools and the like, and bromine has been used in swimming pools and to kill Legionella in swimming pools and cooling towers.

Iodine resin is made according to a method where iodine and a negative ion exchange resin are reacted to produce a stable compound having low solubility in water.

The iodine resin leaves almost no residue of iodine in water having passed the resin and is an excellent antiseptic.

The sterilising mechanism has not been determined yet. However the sterilising action is assumed to work under the following electric charge distribution.

Resin - N^- ..... $I - I - I\delta^+$

where δ^+ defines a positive electric charge.

The positive electric charge on an iodine atom attracts a negatively charged bacterium thereby expediting contact between the bacterium and the I_3^+ group. On contact, -SH groups in the bacterium are oxidised.

The iodine resin granules 21 are generally 0.1mm - 0.3mm in diameter. However, it is more advisable for the granules to be 0.4mm - 1.2mm in diameter. The quantity of resin granules in a water purifier as described above is preferably 10 - 20g.

Although the present invention has described the antiseptic means 20 disposed only in a water purifier, it is not to be taken as limiting. The present invention can be applied to all appliances utilising water such as cool/hot water makers, medicinal water canteens, mineral water canteens, vending machines and so forth.

By way of reference, Figure 7 represents a graph illustrating the bacteria content ratio of water against time, where the points indicated by • represent measured values of bacteria for a water purifier according to the present invention and the points indicated by ▲ represent measured values of bacteria of a prior art water purifier.

As shown in Figure 7, bacteria content increases dramatically with time for prior art purifiers. However, it should be noted that the bacteria content ratio of the water purifier according to the present invention increases little with time. Accordingly, it

can be ascertained that the water purifier with antiseptic means according to the present invention stems the growth of bacteria.

As apparent from the foregoing, there is an advantage in the water purifier according to the present invention, in that antiseptic means in the water purifier kills bacteria and increases the time for which purified water can be stored.

Claims

1. A water purifier comprising filtering means and an antiseptic device.

2. A water purifier according to claim 1, including a plurality of filtering means and a plurality of antiseptic devices.

3. A water purifier according to claim 1 or 2, wherein the or each filtering means comprises a post-process filter and an antiseptic device is located immediately upstream of the or each post-process filter.

4. A water purifier according to claim 1, 2 or 3, wherein the or each antiseptic means comprises a cartridge filled with iodine resin granules, the cartridge having meshes to allow the inflow and outflow of water to be treated but retain the granules in the cartridge.

5. A water purifier according to claim 4, wherein the iodine resin granules are formed by reacting iodine with a negative ion exchange resin.

6. A water purifier according to claim 4 or 5, wherein the granules are from 0.4mm to 1.2mm in diameter and the or each antiseptic means contains from 10g to 20g of iodine resin granules.

7. A water purifier according to claim 4, wherein the or each post-process filter comprises an annular structure of fibriform activated carbon and the cartridge is located within the annular structure.

8. A water purifier according to claim 1 or 2, wherein the or each antiseptic means comprises an assembly upstream of a respective filtering means and connected thereto by a hose.

9. A water purifier according to claim 8, wherein the or each antiseptic means comprises a cartridge filled with iodine resin granules, the cartridge having meshes to allow the inflow and outflow of water to be treated but retain the granules in the cartridge.

10. A water purifier according to claim 9, wherein the iodine resin granules are formed by reacting iodine with a negative ion exchange resin.

11. A water purifier according to claim 9 or 10, wherein the granules are from 0.4mm to 1.2mm in diameter and the or each antiseptic means contains from 10g to 20g of iodine resin granules.

12. A water purifier according to any claim 9, 10 or 11, wherein the or each assembly comprises:

a case;

fastening means for fastening inflow and outflow hoses to the case;

a cylindrical mesh disposed within the case; and

a cartridge filled with iodine resin granules within the cylindrical mesh.

13. A water purifier according to claim 4, wherein the or each cartridge comprises a cup-shaped body having a removable closure at one end, the side wall of the cartridge comprising an annular mesh.

14. A water purifier according to claim 13, wherein axially extending reinforcing members are provided to reinforce the annular mesh.

15. A water purifier according to claim 13 or 14, wherein the closure is formed with a plurality of fine apertures to allow the inflow of water but prevent the escape of resin granules.

16. A water purifier comprising:

a plurality of filtering means at one side of a body thereof so as to filter primary water;

at least more than one antiseptic means at one side of the filtering means in order to restrain bacteria from increasing when purified water is stored in a water storage tank for a long time.

17. The water purifier as defined in claim 16, wherein the filtering means is a post-process filter.

18. .The water purifier as defined in claim 16, wherein the antiseptic means comprises:

a cartridge stuffed with iodine resin; and

a mesh member disposed at an upper side and a lower side of the cartridge.

19. The water purifier as defined in claim 18, wherein the iodine resin is made of iodine and negative ion exchange resin which are absorbed and reacted therebetween.

20. The water purifier as defined in claim 18, wherein the iodine resin consists of a multitude of granules, each granule having a diameter of 0.4mm - 1.2mm, and stuffed quantity therein is 10 - 20grams.

21. The water purifier as defined in claim 18, wherein the cartridge is insertedly disposed at an inner side of fibriform activated carbon formed in the post-process filtering means so as to remove odour and gaseous substances permeated in the water.

22. The water purifier employing a plurality of filtering means at one side of a body thereof so as to filter primary water wherein the purifier is disposed with antiseptic means at a hose passage connectedly formed between the filtering means thereof.

23. The water purifier as defined in claim 22, wherein the antiseptic means comprises:

a case member disposed hose members;

a connecting member disposed at both sides of the case member so as to connect the hose members;

iodine resin stuffed within a cartridge so as to sterilise water flowing through the hose members;

a cylindrical mesh disposed at an external side of the cartridge so as to secure the cartridge stuffed with iodine resin at an inner side of the case member;

a nut member disposed at both sides of the case member so as to prevent the hose members from being bolted.

24. The water purifier as defined in claim 23, wherein the iodine resin is made of iodine and negative ion exchange resin which are absorbed and reacted therebetween to sterilise the purified water.

25. The water purifier as defined in claim 23, wherein the iodine resin is composed multitude of granules, each granule having a diameter of 0.4mm - 1.2mm, and stuffed quantity therein is 10 - 20grams.

26. The water purifier employing a plurality of filtering means at one side of a body thereof in order to filter the primary water, wherein antiseptic means comprises at an inner side of post-process filtering means thereof:

a cartridge body insertedly adhered to an inner side of fibriform activated carbon;

iodine resin stuffed in the cartridge body so as to sterilise the water passing through an inner side of the cartridge body;

a cartridge lid body disposed underneath the cartridge body in order to prevent the iodine resin stuffed in the cartridge body from being discharged; and

a mesh member disposed at a body side of the cartridge body so that the water infused into the cartridge body can be sterilised and discharged afterwards.

27. The water purifier as defined in claim 26, wherein the cartridge body is longitudinally formed at one side thereof with a plurality of reinforcing flames.

28. The water purifier as defined in claim 26, wherein the cartridge lid body comprises:

a tripping jaw formed at one side thereof so as to prevent same from being bolted by being tripped on a fixing jaw of the cartridge body; and

a plurality of fine holes formed at one side thereof so as to allow the water to easily pass therethrough.

29. The water purifier as defined in claim 26, wherein the iodine resin is composed of a multitude of granules, each granule having a diameter of 0.4mm - 1.2mm, and stuffed quantity therein is 10 - 20grams.

30. The water purifier as defined in claim 26, wherein the iodine resin is made of iodine and negative ion exchange resin which are absorbed and reacted therebetween.

31. A water purifier substantially as hereinbefore described with reference to Figure 3 of the accompanying drawings.

32. A water purifier substantially as hereinbefore described with reference to Figure 4 of the accompanying drawings.

33. A water purifier substantially as hereinbefore described with reference to Figures 5 and 6 of the accompanying drawings.